REMARKS/ARGUMENTS

A number of minor, clerical amendments are being made to the paragraphs of the specification listed above. It is submitted that, in each instance, the amendment being entered is of a minor, clerical nature, requiring no detailed comment, and all these amendments are merely intended to ensure that the description is entirely consistent, clear and definite. The final amendment to paragraph [0126] simply corrects a reference numeral, correspond with the reference numeral 131 used in the drawings to identify the tie rods.

With respect to the drawings, amendments are being made to Figures 10 and 11. In Figure 10, the reference numerals 182', 184' and 186' are, in effect, being switched with the reference numerals 182a', 184a' and 186a'. In Figure 11, at the right hand side reference numeral 160e has been amended to read 160ae. Again, these amendments are simply intended to ensure consistent use with the reference numerals and clarity in the drawings.

It is submitted that all these amendments are clearly minor and do not add any new matter.

Claim Rejections

The Examiner has rejected claims 1-4, 22 and 58 under 35 USC 102(e) as being anticipated by Schmid et al., U.S. Patent No. 6,080,503.

Before dealing with the Examiner's detailed analysis of this cited reference, the Examiner is respectfully reminded of the requirements for a reference to anticipate a claim under 35 USC 102, as set out in MPEP 2131. Thus, for anticipation, "a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, as a single prior art reference". Moreover, a single reference must provide an "enabling disclosure".

As is detailed below, it is submitted that the cited reference does not provide a full, enabling disclosure of the invention as presently claimed. The Examiner's detailed arguments are first addressed, followed by more general observations.

The Examiner argued that Schmid et al. teach a fuel cell assembly comprising a plurality of separate elements (abstract), and at least one groove network extending through the fuel cell assembly, citing col. 8, lines 21-32 of the reference. This passage describes a structure shown in Figures 4a, 4b and 4c. Here, just a single pair of plates is shown, including: in Figure 4a, a groove 71 with an overflow groove 72; in Figure 4b just the groove 71 without an additional groove; and in Figure 4c an adhesive material film 53 or adhesive material foil provided between the plates. There is simply no teaching or suggestion that this groove, between one pair of plates, could in any sense be connected to other grooves. Indeed, the reference to an adhesive foil is a direct teaching away from the present invention.

The Examiner cited col. 5, lines 1-6 for the teaching of a seal to provide a barrier between at least two elements to define a chamber for a fluid for operation of the fuel cell. It is known that, in fuel cells, various chambers for the various reactant gases, cooling fluid, etc. need to be formed, defined and sealed. In conventional fuel cells, this is done by providing preformed elastomeric seals and the like.

The Examiner cited col. 5, lines 47-50 for disclosure of "dispensing...and injection molding". It is submitted that this is a significant misreading of this passage, and places an interpretation on this passage that can only be arrived at by hindsight analysis and with full knowledge of the present invention.

Schmid et al. are essentially concerned with providing adhesive bonds between different layers and elements within a fuel cell stack, as identified in the title of the patent and as clearly detailed in the claims, and see the general comments below. This paragraph at col. 5, lines 47-50 merely details different ways in which the adhesive may be applied to the various components. Critically, in the context of the whole patent, it is referring to the application of the adhesive to the individual components, which are then later assembled to form the fuel cell stack. Schmid et al. is notable for providing little or no detail as to how the stack, including the adhesive layers would be assembled, and indeed is arguably not enabling on this point. What is clear is that there is no specific teaching of first assembling the various components and then, after assembly, somehow supplying the adhesive to the various surfaces, grooves, etc. This passage, in

the context of the patent, can only be read to teach that the individual components are to be provided with an adhesive layer by injection molding.

The Examiner then argued that this passage, col. 5, lines 47-50, is considered to encompass "including at least one filling port for the groove network" and "a seal within each groove network that has been formed in place after assembly of the separate elements" since injection molding would require a fitting port to inject the sealant into the structure and injection molding of the sealant would fill in the grooves after assembly of the elements.

Here, the Examiner is making an even more distorted analysis of this passage, based even more strongly on the present invention and the disclosure of the present application. Injection molding may require a filling port to inject the mold material, but there is nothing in Schmid et al. to teach injection of the mold material into a groove network formed between the different elements of a complete fuel cell stack. Again, all that Schmid et al. teach is the injection molding of a seal onto a single component. Thus, a single component, for example, a flow field separator plate, could be placed in a mold, shaped to define the configuration of a seal, and material could then be injected into the mold to form the seal of the desired shape from a desired adhesive material. The flow field plate with the applied adhesive would then be removed from the mold, for later assembly of other components. Indeed, the reference to alternative processes such as "screen printing" and "roll coating" reinforces this interpretation, since these processes could only be applied to individual components.

It is wholly unreasonable to argue that the reference, either inherently or implicitly, teaches the provision of a groove network extending through a fuel cell stack including a filling port for the fuel network. Note that the present invention requires a fuel cell stack to have a plurality of separate elements and a network extending through the fuel cell stack, whereas at most, it is submitted that Schmid et al. teaches the injection molding of an adhesive to a single component of a fuel cell stack.

The reference to "injection molding" further implicitly suggests the presence of a mold, which is necessarily required to injection mold a seal to one flow field plate, for example. If Schmid et al. truly taught injection molding into a groove

network with the stack itself, it would be made clear that no mold was required. Further, while any injection mold must include a fill port, it would then be necessary to provide the fill port in the stack itself, but there is no mention of any such feature.

The Examiner then argued that Schmid et al. "teach the groove network comprises a plurality of closed groove segments, each of which comprises at least a groove segment in one of the separate elements that faces and is closed by another of the separate elements, to form the closed groove segments (Fig. 4b)". She further argued that Schmid et al. teaches that the fuel assembly comprises a plurality of individual fuel cells (stack), and referred to the abstract of Schmid et al. On this latter point, no argument is made that a plurality of fuel cells by themselves is a novel feature, but Schmid et al. do not teach providing a groove network that extends through a plurality of elements. Rather, all that is shown in Fig. 4b is the provision of a single groove around a single element. If the grooves in the different elements are to be connected, then the figures would need to show some connecting groove extending generally perpendicularly to the plane of the individual plates, and this feature is entirely absent from the reference. In contrast, the present invention provides a connection aperture 160 that provides a connection through the various flow field plates (see, for example, paragraph 117 and elsewhere in present specification).

The Examiner then referred to Fig. 3c for teaching that at least some of the closed groove segments each comprise a first groove segment in one of the separate elements facing a second groove segment in another of the separate elements. This feature may indeed be provided in Fig. 3c. What is striking in Fig. 3c is that the grooves 54 are provided to accommodate the adhesive agent 50, where there is a total absence of any way for the adhesive agent to communicate through or around the membrane of the MEA 5 that extends between them. Indeed, the passage at col. 7, lines 34-40 make it clear that the intention is for the adhesive bonding agent to be applied to the MEA first. Thus, this passage provides:

> "...the adhesive bonding agent 50 is generally applied to the MEA, and the MEA 5 is consolidated with the separator plates 11, 12 immediately after the application of adhesive or

> at least the full hardening of the adhesive. Openings for fluid manifolds may be sealed in the same fashion."

This teaches directly away from the present invention, and specifically provides that the adhesive be applied to the membrane of the MEA before it is sandwiched between the separator plates 11, 12.

The Examiner then argued that Schmid et al. teaches "a fuel cell assembly including at least one fuel cell and, on one side, a seal molded in place to abut the other side of another, similar assembly to form a chamber for coolant, whereby a plurality of assemblies can be assembled to form a large fuel cell unit assembly...", and cited col. 4, lines 59, 67 and col. 5, lines 1-12 of the reference. Again, the teaching here is contrary to that of the present invention. What this passage teaches is that, in the same manner as providing an adhesive seal between the separator plates, within each individual cell, an adhesive bond can be provided between separator plates of adjacent cells, e.g., at col. 4, lines 60-61, it is stated that "separator plates of adjacent PEM modules may be adhesively bonded together". It goes on to provide, at lines 61-66, that:

> "They may be bonded across substantially their entire contacting surfaces, or, similar to the adhesive bond between the MEA and each separator plate, the separator plates of adjacent modules may be joined with an adhesive around their perimeter and around any fluid manifold openings."

In contrast, the present invention, in its modular concept intends to form a seal within the module itself by providing a groove network extending through the module, together with an external seal if required for abutting another similar module. Critically, there is no intention or teaching that adjacent modules be permanently bonded together in any manner, e.g. by an adhesive bond. Rather, the teaching is exactly the opposite that the modules remain separable, so that if any defect is detected, the modules can be readily separated and a defected module replaced. This concept of a membrane electrode unit or MEU is detailed in paragraph 143, 144, 145 and other parts of the present specification.

The Examiner then cited the teaching of an electro-chemical cell comprising a plurality of separate elements and at col. 8, lines 21-32, the teaching of a provision of at least one groove network extending through the assembly. This rejection is also respectfully traversed and it is again submitted that the Examiner has misread this passage of the cited reference. As detailed above, this passage merely describes different groove configuration in individual plates. There is again a total absence of any suggestion or teaching that the grooves between each pair of plates are somehow connected to one another.

The Examiner cited col. 5, lines 1-6 for teaching the provision of at least two elements to define a chamber for a fluid operation assembly, and again the arrangement of individual chambers within a fuel cell stack is not alleged, by itself, to be new.

The Examiner again cited the passage at col. 5, lines 47-50 for teaching "dispensing...and injection molding". To reiterate, it is submitted that, on a proper reading and based just on the disclosure in this patent and not the disclosure of the present application, this passage simply teaches that components, individually, could be provided with an adhesive by injection molding. Again, there is simply no teaching of "including at least one filling port for the groove network"; a filling port may be implicit in injection molding, but there is no disclosure of an interconnected groove network with a fill port in the fuel cell stack itself. Nor is there any disclosure of a "seal within each groove network that has been formed in place after assembly of the separate elements". These elements are not in any way inherent or implicit in this disclosure, and the fact that the Examiner cites language from the present application rather than relevant passages from the reference supports this argument.

More generally, looking at Schmid et al., as a whole, this reference is concerned with improving the sealing and construction of fuel cell stacks. As detailed in the present specification, a problem with fuel cell stacks is that, for any large stack, there can be hundreds of individual seals, all of which have to be perfectly formed, or the stack will leak, requiring the entire stack to be disassembled and then reassembled.

The basic thrust or the teaching of this reference is that, instead of providing individual elastomeric-type seals, adhesive should be used to bond the different components together. Thus, the paragraph bridging col. 3 and 4, at the start of the Summary of the Invention, details the type of adhesive materials that could be used. It is noted that "In the present approach, the MEA is firmly bonded or adhered to the separator plates such that force would be required to separate the components. This contrasts with conventional PEM cell elastomeric seals...". Thus, Schmid et al. accept the conventional approach of providing individual seals, and merely teach substituting a different material for the seal.

Applicant respectfully submits that the claims are allowable, and requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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Attachments